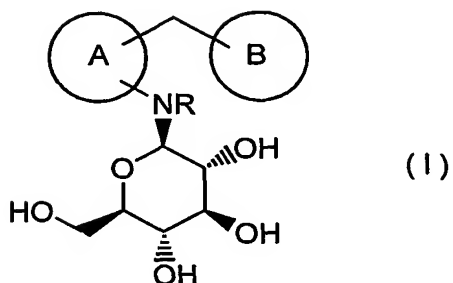


## CLAIMS

1. A compound of formula:



5 wherein Ring A and Ring B are (1) Ring A is an optionally substituted unsaturated monocyclic heterocyclic ring, and Ring B is an optionally substituted unsaturated monocyclic heterocyclic ring, an optionally substituted unsaturated fused heterobicyclic ring, or an optionally substituted benzene ring,  
 10 (2) Ring A is an optionally substituted benzene ring, and Ring B is an optionally substituted unsaturated monocyclic heterocyclic ring, an optionally substituted unsaturated fused heterobicyclic ring, or an optionally substituted benzene ring,  
 15 or (3) Ring A is an optionally substituted unsaturated fused heterobicyclic ring, wherein -NR- group and -CH<sub>2</sub>- group are both on the same ring of the unsaturated fused heterobicyclic ring, and Ring B is an optionally substituted monocyclic unsaturated heterocyclic ring, an optionally substituted unsaturated fused heterobicyclic ring, or an optionally substituted benzene ring;  
 20 and

R is a hydrogen atom, a lower alkyl group, a lower alkanoyl group or a lower alkoxy carbonyl group, or a pharmaceutically acceptable salt thereof, or a prodrug thereof.

25 2. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the optionally substituted unsaturated monocyclic heterocyclic ring is an unsaturated monocyclic heterocyclic ring which may

optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxyl group, an alkoxy group, an alkyl group, a haloalkyl group, a haloalkoxy group, a hydroxyalkyl group, an alkoxyalkyl group, an alkoxyalkoxy group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, a cycloalkenyl group, a cycloalkyloxy group, an aryl group, an aryloxy group, an arylalkoxy group, a cyano group, a nitro group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, an alkoxycarbonylamino group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkanoyl group, an alkylsulfonylamino group, an arylsulfonylamino group, an alkylthio group, an alkylsulfinyl group, an alkylsulfonyl group, an arylsulfonyl group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a heterocyclyl group, and an oxo group;

the optionally substituted unsaturated fused heterobicyclic ring is an unsaturated fused heterobicyclic ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxyl group, an alkoxy group, an alkyl group, a haloalkyl group, a haloalkoxy group, a hydroxyalkyl group, an alkoxyalkyl group, an alkoxyalkoxy group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, a cycloalkenyl group, a cycloalkyloxy group, an aryl group, an aryloxy group, an arylalkoxy group, a cyano group, a nitro group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, an alkoxycarbonylamino group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkanoyl group, an alkylsulfonylamino group, an alkylthio group, an arylsulfonylamino group, an alkylsulfinyl group, an alkylsulfonyl group, an arylsulfonyl group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a heterocyclyl group, and

an oxo group; and

the optionally substituted benzene ring is a benzene ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxyl group, an alkoxy group, an alkyl group, a haloalkyl group, a haloalkoxy group, a hydroxyalkyl group, an alkoxyalkyl group, an alkoxyalkoxy group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, a cycloalkenyl group, a cycloalkyloxy group, an aryl group, an aryloxy group, an arylalkoxy group, a cyano group, a nitro group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, an alkoxycarbonylamino group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkanoyl group, an alkylsulfonylamino group, an arylsulfonylamino group, an alkylthio group, an alkylsulfinyl group, an alkylsulfonyl group, an arylsulfonyl group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a heterocyclyl group, an alkylene group, an alkyleneoxy group, an alkylenedioxy group, and an alkenylene group.

3. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the optionally substituted unsaturated monocyclic heterocyclic ring is an unsaturated monocyclic heterocyclic ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxyl group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an alkylthio group, an alkylsulfonyl group, an alkylsulfinyl group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkylsulfonylamino group, a phenyl

group, a phenoxy group, a phenylsulfonylamino group, a phenylsulfonyl group, a heterocyclyl group, and an oxo group;

the optionally substituted unsaturated fused heterobicyclic ring is an unsaturated fused heterobicyclic ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxyl group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an alkylthio group, an alkylsulfonyl group, an alkylsulfinyl group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkylsulfonylamino group, a phenyl group, a phenoxy group, a phenylsulfonylamino group, a phenylsulfonyl group, a heterocyclyl group, and an oxo group; and

the optionally substituted benzene ring is a benzene ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxyl group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an alkylthio group, an alkylsulfonyl group, an alkylsulfinyl group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkylsulfonylamino group, a phenyl group, a phenoxy group, a phenylsulfonylamino group, a phenylsulfonyl group, a heterocyclyl group, an alkylene group, and an alkenylene group;

wherein the substituents on the unsaturated monocyclic heterocyclic ring, the unsaturated fused heterobicyclic ring

and the benzene ring may further be substituted by 1-3 substituents, independently selected from the group consisting of a halogen atom, a hydroxyl group, a cyano group, an alkyl group, a haloalkyl group, an alkoxy group, a haloalkoxy group, an alkanoyl group, an alkylthio group, an alkylsulfonyl group, a mono- or di-alkylamino group, a carboxyl group, an alkylenedioxy group, an alkyleneoxy group, an alkoxycarbonyl group, a phenyl group, and an oxo group.

4. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the optionally substituted unsaturated monocyclic heterocyclic ring is an unsaturated monocyclic heterocyclic ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxy group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, an alkoxycarbonylamino group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, a phenyl group, a heterocyclyl group, and an oxo group;

the optionally substituted unsaturated fused heterobicyclic ring is an unsaturated fused heterobicyclic ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxy group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, an alkoxycarbonylamino group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, a phenyl group, a heterocyclyl group, and an oxo group; and the optionally substituted benzene ring is a benzene ring

which may optionally be substituted by 1-3 substituents selected from the group consisting of a halogen atom, a hydroxy group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, an alkoxycarbonylamino group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, a phenyl group, a heterocyclyl group, and an alkylene group;

wherein the substituents for the unsaturated monocyclic heterocyclic ring, the unsaturated fused heterobicyclic ring and the benzene ring may further be substituted by 1-3 substituents, independently selected from the group consisting of a halogen atom, a cyano group, a hydroxy group, an alkyl group, a haloalkyl group, an alkoxy group, a haloalkoxy group, an alkanoyl group, a mono- or di-alkylamino group, a carboxyl group, a phenyl group, an alkylenedioxy group, an alkyleneoxy group, and an alkoxycarbonyl group.

5. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein Ring A is a benzene ring which may optionally be substituted by 1-3 substituents, independently selected from the group consisting of a halogen atom, a hydroxy group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an alkylthio group, an alkylsulfonyl group, an alkylsulfinyl group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkylsulfonamino group, a phenyl group, a phenoxy group, a phenylsulfonamino group, a phenylsulfonyl group, a heterocyclyl group, an alkylene group,

an alkenylene group, and an alkenylene group, and

Ring B is a benzene ring, which may optionally be substituted by 1-3 substituents, independently selected from the group consisting of a halogen atom, a hydroxy group, a cyano group, a nitro group, an alkyl group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, an alkoxy group, an alkanoyl group, an alkylthio group, an alkylsulfonyl group, an alkylsulfinyl group, an amino group, a mono- or di-alkylamino group, a sulfamoyl group, a mono- or di-alkylsulfamoyl group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkylsufonylamino group, a phenyl group, a phenoxy group, a phenylsulfonylamino group, a phenylsulfonyl group, a heterocyclyl group, an alkylene group, and an alkenylene group;

wherein the substituent on Ring A and Ring B may optionally be substituted by 1-3 substituents, independently selected from the group consisting of a halogen atom, a cyano group, an alkyl group, a haloalkyl group, an alkoxy group, a haloalkoxy group, an alkanoyl group, a mono- or di-alkylamino group, a carboxyl group, a hydroxy group, a phenyl group, an alkylenedioxy group, an alkyleneoxy group, and an alkoxycarbonyl group.

6. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein substitution pattern of the -NR- group and the -CH<sub>2</sub>- group on Ring A is 1,2-substitution or 1,3-substitution.

7. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the -CH<sub>2</sub>- group is linked at 3-position to the -NR- group on Ring A; Ring A is a benzene ring which may optionally be substituted by a substituent selected from the group consisting of a lower alkyl group, a halo-lower alkyl group, a halogen atom, a lower alkoxy group, and a phenyl group; and Ring B is an unsaturated 5- or 6-membered monocyclic heterocyclic ring which may

optionally be substituted by 1-3 substituents selected from the group consisting of a lower alkyl group, a halo-lower alkyl group, a phenyl-lower alkyl group, a halogen atom, a lower alkoxy group, a halo-lower alkoxy group, a phenyl group, a halophenyl group, a cyanophenyl group, a lower alkylphenyl group, a halo-lower alkylphenyl group, a lower alkoxyphenyl group, a mono- or di-lower alkylaminophenyl group, a heterocyclyl group, a haloheterocyclyl group, a lower alkylheterocyclyl group, a lower alkoxyheterocyclyl group, and a mono- or di-lower alkylaminoheterocyclyl group.

8. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the  $-CH_2-$  group is linked at 3-position to the  $-NR-$  group on Ring A; Ring A is an unsaturated 5- or 6-membered monocyclic heterocyclic ring which may optionally be substituted by a substituent selected from the group consisting of a lower alkyl group, a halogen atom, a lower alkoxy group, and an oxo group; and Ring B is a benzene ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a lower alkyl group, a halo-lower alkyl group, a halogen atom, a lower alkoxy group, a halo-lower alkoxy group, a phenyl group, a halophenyl group, a cyanophenyl group, a lower alkylphenyl group, a halo-lower alkylphenyl group, a lower alkoxyphenyl group, a heterocyclyl group, a haloheterocyclyl group, and a lower alkylheterocyclyl group.

9. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the  $-CH_2-$  group is linked at 3-position to the  $-NR-$  group on Ring A; Ring A is an unsaturated 5- or 6-membered monocyclic heterocyclic ring which may optionally be substituted by a substituent selected from the group consisting of a lower alkyl group, a halogen atom, a lower alkoxy group, and an oxo group; and Ring B is an unsaturated 5- or 6-membered monocyclic



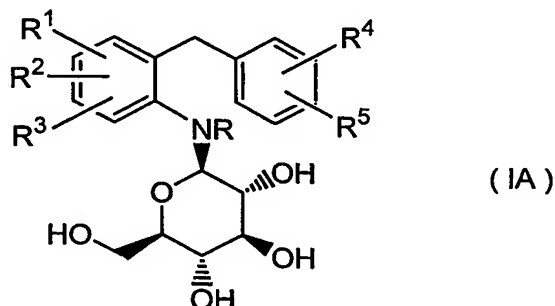
heterocyclic ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a lower alkyl group, a halo-lower alkyl group, a halogen atom, a lower alkoxy group, a halo-lower alkoxy group, a phenyl group, a halophenyl group, a cyanophenyl group, a lower alkylphenyl group, a halo-lower alkylphenyl group, a lower alkoxyphenyl group, a heterocyclyl group, a haloheterocyclyl group, and a lower alkylheterocyclyl group.

10. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the  $-CH_2-$  group is linked at 3-position to the  $-NR-$  group on Ring A; Ring A is a benzene ring which may optionally be substituted by a substituent selected from the group consisting of a lower alkyl group, a hydroxy-lower alkyl group, a halo-lower alkyl group, a lower alkoxy-lower alkyl group, a halogen atom, a lower alkoxy group, a halo-lower alkoxy group, a lower alkoxy-lower alkoxy group, and a phenyl group; and Ring B is a benzene ring which may optionally be substituted by 1-3 substituents selected from the group consisting of a lower alkyl group, a halo-lower alkyl group, a phenyl-lower alkyl group, a halogen atom, a lower alkoxy group, a halo-lower alkoxy group, a phenyl group, a halophenyl group, a cyanophenyl group, a lower alkylphenyl group, a halo-lower alkylphenyl group, a lower alkoxyphenyl group, a methylenedioxyphenyl group, an ethyleneoxyphenyl group, a mono- or di-lower alkylaminophenyl group, a heterocyclyl group, a haloheterocyclyl group, and a lower alkylheterocyclyl group.

11. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to any one of claims 1 to 10, wherein the unsaturated monocyclic heterocyclic ring is furan, thiophene, oxazole, isoxazole, triazole, tetrazole, pyrazole, pyridine, pyrimidine, pyrazine, dihydroisoxazole, dihydropyridine, or thiazole; and the unsaturated fused heterobicyclic ring is indoline, isoindoline, benzothiazole,

benzoxazole, indole, indazole, quinoline, isoquinoline, benzothiophene, benzofuran, thienothiophene, or dihydro-isoquinoline.

12. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 1, wherein the compound is represented by the following formula IA:



wherein  $R^1$ ,  $R^2$ , and  $R^3$ , are independently a hydrogen atom, a halogen atom, a hydroxyl group, an alkoxy group, an alkyl group, a haloalkyl group, a haloalkoxy group, a hydroxyalkyl group, an alkoxyalkyl group, an alkoxyalkoxy group, an alkenyl group, an alkynyl group, a cycloalkyl group, a cycloalkylidenemethyl group, a phenyl group, a phenylalkoxy group, a cyano group, a nitro group, an amino group, a mono- or di-alkylamino group, an alkanoylamino group, a carboxyl group, an alkoxycarbonyl group, a carbamoyl group, a mono- or di-alkylcarbamoyl group, an alkanoyl group, an alkylsulfonylamino group, a phenylsulfonylamino group, an alkylsulfinyl group, an alkylsulfonyl group or a phenylsulfonyl group;

$R^4$  and  $R^5$  are independently a hydrogen atom; a halogen atom; a hydroxyl group; an alkoxy group; an alkyl group; a haloalkyl group; a haloalkoxy group; a hydroxyalkyl group; an alkoxyalkyl group; a phenylalkyl group; an alkoxyalkoxy group; a hydroxyalkoxy group; an alkenyl group; an alkynyl group; a cycloalkyl group; a cycloalkylidenemethyl group; a phenyloxy group; a phenylalkoxy group; a cyano group; a nitro group; an amino group; a mono- or di-alkylamino group; an alkanoylamino

group; a carboxyl group; an alkoxycarbonyl group; a carbamoyl group; a mono- or di-alkylcarbamoyl group; an alkanoyl group; an alkylsulfonylamino group; a phenylsulfonylamino group; an alkylsulfinyl group; an alkylsulfonyl group; a phenylsulfonyl group; a phenyl group optionally substituted by a halogen atom, a cyano group, an alkyl group, a haloalkyl group, an alkoxy group, a haloalkoxy group, a alkylenedioxy group, an alkyleneoxy group, or a mono- or di-alkylamino group; or a heterocyclyl group optionally substituted by a halogen atom, a cyano group, an alkyl group, a haloalkyl group, an alkoxy group, or a haloalkoxy group, or R<sup>4</sup> and R<sup>5</sup> are combined with each other at the terminals thereof to form an alkylene group; and

R is a hydrogen atom, a lower alkyl group, a lower alkanoyl group or a lower alkoxycarbonyl group.

13. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 12, wherein R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup> are independently a hydrogen atom, a halogen atom, a lower alkyl group, a hydroxy-lower alkyl group, a halo-lower alkyl group, a lower alkoxy-lower alkyl group, a lower alkoxy group, a halo-lower alkoxy group, or a lower alkoxy-lower alkoxy group;

R<sup>4</sup> and R<sup>5</sup> are independently a hydrogen atom; a halogen atom; a lower alkyl group; a halo-lower alkyl group; a phenyl-lower alkyl group; a phenyl group optionally substituted by a halogen atom, a cyano group, a lower alkyl group, a halo-lower alkyl group, a lower alkoxy group, a methylenedioxy group, an ethyleneoxy group, or a mono- or di-lower alkylamino group; or a heterocyclyl group optionally substituted by a halogen atom, or a lower alkyl group, or R<sup>4</sup> and R<sup>5</sup> are combined with each other at the terminals thereof to form an alkylene group.

14. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 12, wherein R<sup>1</sup> is a halogen atom, a lower alkyl group, or a lower alkoxy

group,  $R^2$  and  $R^3$  are a hydrogen atom,  $R^4$  is a halogen atom; a lower alkyl group; a lower alkoxy group; a phenyl group optionally substituted by a substituent selected from the group consisting of a halogen atom, a cyano group, a lower alkyl group, a halo-lower alkyl group, a lower alkoxy group, and a mono- or di-lower alkylaminogroup; or a heterocyclyl group optionally substituted by a halogen atom or a lower alkyl group, and  $R^5$  is a hydrogen atom.

15. The compound, the pharmaceutically acceptable salt thereof or the prodrug thereof according to claim 12, 13 or 14, wherein the heterocyclyl group is a thienyl group, a pyridyl group, a pyrimidyl group, a pyrazinyl group, a pyrazolyl group, a thiazolyl group, a quinolyl group, tetrazolyl.

16. A pharmaceutical composition which comprises the compound, the pharmaceutically acceptable salt thereof or the prodrug thereof as set forth in any one of claims 1 to 15, and a pharmaceutically acceptable carrier.

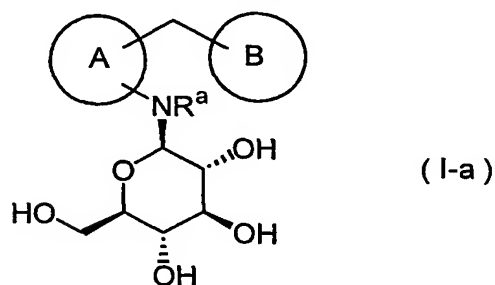
17. The pharmaceutical composition according to claim 16, which further comprises another antidiabetic agent.

18. A method for treating or delaying the progression or onset of diabetes, diabetic retinopathy, diabetic neuropathy, diabetic nephropathy, delayed wound healing, insulin resistance, hyperglycemia, hyperinsulinemia, elevated blood levels of fatty acids, elevated blood levels of glycerol, hyperlipidemia, obesity, hypertriglyceridemia, Syndrome X, diabetic complications, atherosclerosis or hypertension, which comprises administering to a mammalian species in need of treatment a therapeutically effective amount of the compound, the pharmaceutically acceptable salt thereof, or the prodrug thereof as set forth in claim 1.

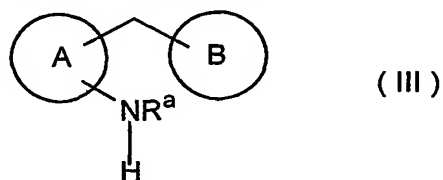
19. A method for treatment of type 1 and 2 diabetes mellitus, which comprises administering to a mammalian species in need of treatment a therapeutically effective amount of the

compound, the pharmaceutically acceptable salt thereof, or the prodrug thereof as set forth in claim 1 alone, or in combination with another antidiabetic agent, an agent for treating diabetic complications, an anti-obesity agent, an antihypertensive agent, an antiplatelet agent, an anti-atherosclerotic agent and/or a hypolipidemic agent.

20. A process for preparing a compound of formula I-a:



wherein Ring A and Ring B are as defined in claim 1, and  $R^a$  is hydrogen atom or a lower alkyl group, which comprises condensing a compound of formula III:



wherein the symbols are the same as defined above, and a compound of formula II:

